

Lesson 6-4 (pp. 304–310)**Point-Slope Form and Writing Linear Equations****Lesson Objectives**

- 1 Graph and write linear equations using point-slope form
- 2 Write a linear equation using data

NAEP 2005 Strand:

Topics: Patterns, Relations, and Functions; Variables, Expressions, and Operations

Local Standards: _____

Key Concepts**Point-Slope Form of a Linear Equation**

The point-slope form of the equation of a nonvertical line that passes through the point (x_1, y_1) with slope m is $y - y_1 = m(x - x_1)$.

Linear Equations**Slope-Intercept Form**

$$y = mx + b$$

m is the slope and b is the y -intercept.

Examples

$$y = -\frac{2}{3}x + \frac{5}{3}$$

Standard Form

$$Ax + By = C$$

A and B are not both 0.

Point-Slope Form

$$(y - y_1) = m(x - x_1)$$

(x_1, y_1) lies on the graph of the equation, and m is the slope.

$$y - 1 = -\frac{2}{3}(x - 1)$$

Examples

- 1 Graphing Using Point-Slope Form** Graph the equation

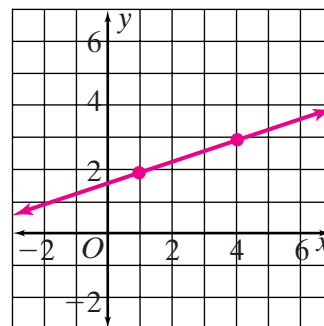
$$y - 2 = \frac{1}{3}(x - 1).$$

The equation shows that the line passes through $(1, 2)$ with slope $\frac{1}{3}$.

Start at $(1, 2)$.

Using the slope, go up 1 unit and right 3 units to $(4, 3)$.

Draw a line through the two points.



- 2 Writing an Equation in Point-Slope Form** Write the equation of the line with slope -2 that passes through the point $(3, -3)$.

$$y - y_1 = m(x - x_1)$$

Use point-slope form.

$$y - (-3) = -2(x - 3)$$

Substitute $(3, -3)$ for (x_1, y_1) and -2 for m .

$$y + 3 = -2(x - 3)$$

Simplify.

The equation is $y + 3 = -2(x - 3)$.

③ Using Two Points to Write an Equation

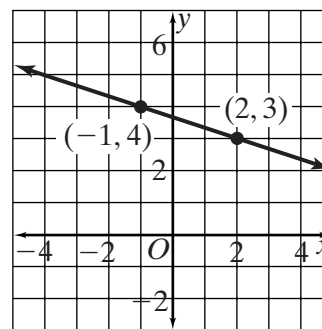
Write equations for the line in point-slope form and in slope-intercept form.

Step 1 Find the slope.

$$\frac{y_2 - y_1}{x_2 - x_1} = m$$

$$\frac{\boxed{4} - \boxed{3}}{\boxed{-1} - \boxed{2}} = \boxed{-\frac{1}{3}}$$

The slope is $\boxed{-\frac{1}{3}}$.



Step 2 Use either point to write the equation in point-slope form.

Use $(-1, 4)$.

$$y - y_1 = m(x - x_1)$$

$$y - \boxed{4} = \boxed{-\frac{1}{3}}(x - (\boxed{-1}))$$

$$\boxed{y - 4 = -\frac{1}{3}(x + 1)}$$

Step 3 Rewrite the equation from Step 2 in slope-intercept form.

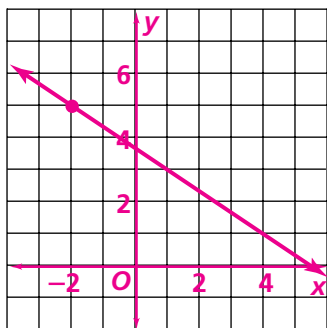
$$y - \boxed{4} = \boxed{-\frac{1}{3}}(x + \boxed{1})$$

$$y - \boxed{4} = \boxed{-\frac{1}{3}}x - \boxed{\frac{1}{3}}$$

$$\boxed{y = -\frac{1}{3}x + 3\frac{2}{3}}$$

Check Understanding

- Graph the equation $y - 5 = -\frac{2}{3}(x + 2)$.



- Write the equation of the line with slope $\frac{2}{5}$ that passes through the point $(10, -8)$.

$$\boxed{y + 8 = \frac{2}{5}(x - 10)}$$

Example

- 4 Writing an Equation Using a Table** Is the relationship shown by the data linear? If so, model the data with an equation.

Step 1 Find the rate of change for consecutive ordered pairs.

$$\frac{-2}{-1} = 2$$

$$\frac{-6}{-3} = 2$$

$$\frac{-4}{-2} = 2$$

x	y	
3	6	-1 (3, 6) = -2
2	4	-3 (2, 4) = -6
-1	-2	-2 (-1, -2) = -4
-3	-6	

The relationship is linear. The rate of change is 2.

Step 2 Use the slope and a point to write an equation.

$$y - y_1 = m(x - x_1) \quad \text{Use point-slope form.}$$

$$y - 4 = 2(x - 2) \quad \text{Substitute (2, 4) for } (x_1, y_1) \text{ and 2 for } m.$$

Check Understanding

- 3. a.** Write an equation for the line in Example 3 in point-slope form using point (2, 3).

$$y - 3 = -\frac{1}{3}(x - 2)$$

- b.** Write the equation you found in part (a) in slope-intercept form.

$$y = -\frac{1}{3}x + \frac{10}{3}$$

- 4.** Is the relationship shown by the data in the table linear? If so, model the data with an equation.

Yes; answers may vary.
Sample: $y - 3030 = -\frac{50}{3}(x - 68)$

Working Outdoors

Temperature	Calories Burned per Minute
68°F	3030
62°F	3130
56°F	3230
50°F	3330